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Regency Clusterization Based on Village Characteristics to Increase the Human Development Index (IPM) in Papua Province

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Abstract

Inequality in the Human Development Index (IPM) in Papua Province amid the disbursement of development funds needs to be studied adequately so that the policies and programs that have been planned can be more directed and on target. For this reason, research is needed that can map the priority needs of each district in Papua Province by identifying regional characteristics, namely villages. By using Cluster Analysis and Factor Analysis, the results of this research show that 4 district clusters in Papua Province were formed with different priority focuses on increasing the HDI. The main focus of the district HDI improvement priorities in Papua Province is divided into three through factor analysis: the infrastructure-telecommunication factor, the sanitation-economic factor, and the health-education factor. Each cluster is generally still dominated by districts with a low HDI category. The main obstacle to increasing HDI in Papua Province is the transportation and telecommunications infrastructure factor. Local governments are expected to be able to formulate human development programs and policies concerning the priority needs of each district as a result of this research.

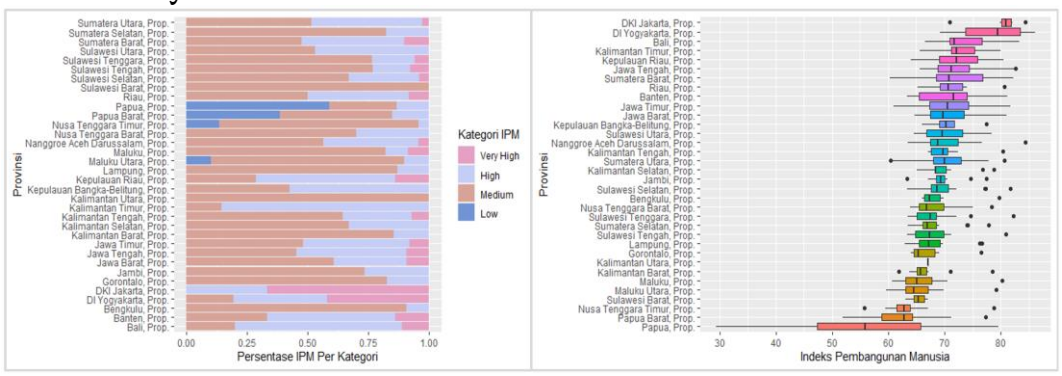
INTRODUCTION

United Nations Development Program (UNDP), for the first time in 1990, introduced the Human Development Index (IPM), which aims to measure the success of the development of the quality of human life. HDI is compiled by focusing on three basic dimensions: education, health, and a decent standard of living (UNDP, 1990). To support human accessibility in these three basic dimensions, it is necessary to have adequate infrastructure in each area that can be identified from the characteristics of the village. Availability and equity of infrastructure facilities in towns are essential because if not, it will impact regional development gaps. In essence, each region, in this case, the district, has different village characteristics, so the human development carried out must be adapted to these characteristics, which are the priority of each section. In mapping the quality of the human product in various regions, at least four HDI categories are divided based on the HDI achievement scores, namely very high, high, medium, and low. Changing the status of the HDI category is an indicator to see the development of human development in a region (Central Bureau of Statistics, 2019). In Indonesia, the distribution of

district/city HDI achievements by province can be seen in Figure 1. Looking at the HDI composition per category, more than half of the districts/cities in Papua Province are in the low HDI category. In percentage terms, this figure is the highest compared to other provinces, and none of the districts/cities in Papua Province have a very high HDI category.

Regarding distribution, the average district/city HDI score in Papua Province ranks lowest compared to the central district/city HDI score in other provinces. If we examine the distribution of HDI scores between districts/cities within the same area, Papua Province has the most varied distribution compared to other regions. On average, the quality of human development in Papua Province is still lagging and unequal compared to other provinces.

Picture 1. Distribution of Regency/City Human Development Index (IPM) by Province in 2018



Source: BPS, 2019

Human development in Papua Province so far has not shown encouraging results. It seems that the allocation of village funds has not been able to appropriately target priority programs according to the characteristics of each region which are, of course, different. So, the various programs that have been implemented have not significantly impacted human development in Papua Province; This is not in line with the findings Rimawan & of Aryani (2019) that village funds greatly influence the increase in HDI. In addition, through Law Number 21 of 2001, the government has provided special autonomy funds to Papua to spur the economy and catch up. However, the increase in the number of special autonomy funds from year to year has not been matched by a significant increase in the Human Development Index in Papua(Juliarini & Hatmoko, 2020). In their study, Putra & Pratiwi (2019)apply factor analysis and cluster analysis to identify development policies based on regional characteristics in Kalimantan. The studies show that factor analysis and cluster analysis are pretty good at showing clusters formed based on similarities in socioeconomic characteristics and factors related to development policies that need to be prioritized.

Regional-based development can be carried out to achieve effective and directed human results by identifying factors that can influence the

increase in HDI. Factors such as the number of health facilities, the number of nurse-midwives, and the ratio of schools per primary school student have a significant positive effect on HDI (Latuconsina & Zulfikar, 2017).In terms of infrastructure, access to electricity, access to good sources of drinking water, and road density also have a significant positive effect on increasing the HDI of a region. (Sapkota, 2014).In addition, most rural communities' living conditions can positively and significantly affect their quality of life. The availability of good water sources for family needs, wastewater disposal, and air humidity will improve the quality of life of the village community itself (Kosim et al., 2015). Sanitation development also needs to be carried out evenly so that it can have an impact on the Human Development Index(Purwaningsih et al., 2021). Community welfare, as reflected in the poverty rate, also has a significant effect on the HDI of a region (Maulana et al., 2022).

Several previous studies have made clustering of districts in Papua Province without carrying out the process of grouping variables into several factors first. Among them is research conducted by Chelvin Pratama & Nasrudin (2022) and Afrida & Wulandari (2022); for this study, the authors are interested in identifying important factors that are the priority human development districts in Papua Province. The elements were first formed from the characteristics of villages in various communities in Papua Province. Then the details developed will be used to cluster districts in the Province of Papua so that the factors that are the priorities of each cluster are obtained to increase the HDI of communities in the Province of Papua. This can be important input for the central government to the villages in determining development policies so that they can be more focused and equitable; they can spur an increase in the HDI in Papua Province.

RESEARCH METHODS

Research Data and Variables

The primary data used in this study to describe the characteristics of villages or kelurahan in Papua Province was extracted from PODES 2018 published by Badan Pusat Statistik (BPS). PODES (Potensi Desa, or Village Potentials) is a comprehensive data collection conducted by BPS every three years (census) in definitive villages/kelurahan/nagari in Indonesia.

This research used the results from PODES 2018 before the Covid-19 pandemic. Using the 2018 Podes data is considered to explore more associations or interactions between characteristics of village/kelurahan and HDI without the impact of other phenomena, such as the Covid-19 pandemic, which is already captured in PODES 2021. Since the Covid-19 pandemic occurred in 2020, the government has focused on handling Covid-19 so that it has an impact on the allocated budget for various sectors, including infrastructure and public facilities.

Based on Village Potential data for 2018, there are 5552 villages in 28 regencies in Papua Province which will be the object of this research. In

addition, additional information is used, namely the 2018 Regency Human Development Index in Papua Province, which also comes from BPS.

Table 1.Research variable

Variable	Definition
infra_01	Percentage of Villages/Kelurahan with road access conditions between Villages/Kelurahan at least being hardened
infra_02	Percentage of Villages/Kelurahans with road access conditions between Villages/Kelurahans accessible throughout the year by four-wheeled vehicles
infra_03	Percentage of Villages/Kelurahan with road access to production centers accessible throughout the year by four-wheeled vehicles
infra_04	Percentage of Villages/Kelurahan with minimum road access conditions to production centers
infra_05	Percentage of Villages/Kelurahan that cell phone signals can reach
infra_06	Percentage of Villages/Kelurahan that can be reached by internet signal
infra_07	Percentage of Villages/Kelurahan that TV broadcasts can reach
eco_01	Percentage of Villages/Kelurahan that have markets
eco_02	Percentage of Villages/Kelurahan with the primary source of income for the majority of people coming from the non-agricultural sector
eco_03	Percentage of Villages/Kelurahans exporting their region's superior products
sani_01	Percentage of Villages/Kelurahan with drinking water for the majority of the population at least from wells
sani_02	Percentage of Villages/Kelurahan where the majority of people throw garbage in the trash
sani_03	Percentage of Villages/Kelurahan that have temporary waste disposal sites
sani_04	Percentage of Villages/Kelurahan where most of the people already have latrines
sani_05	Percentage of Villages/Kelurahan that have waste treatment
educate_01	Percentage of Villages/Kelurahan that have educational facilities for SD, SMP, SMA or SMK
healthy_01	Percentage of Villages/Kelurahan that have health facilities
healthy_02	Percentage of Villages/Kelurahan with cases of malnutrition
healthy_03	Percentage of Villages/Kelurahan that have midwives

sejah_01	Percentage of families in one district that do not use electricity
sejah_02	Percentage of the number of certificates of incapacity (SKTM) issued by Villages/Kelurahans in one district

Method

This study used two methods: factor analysis and cluster analysis. The data processing process is carried out by first identifying the characteristics of the village, which, based on the literature review, influence the district HDI. Furthermore, the village features are aggregated to obtain variables for the district level. Then all these variables are grouped using factor analysis. Finally, cluster analysis is used to group/cluster districts in Papua Province based on several previously established factors.

(1) *Factor Analysis*

Factor Analysis is a classic technique developed in the statistical literature to identify latent sources (Hastie et al., 2001). Suppose q < p, the factor analysis model is in the form of:

$$\begin{aligned} X_1 &= a_{11}S_1 + \cdots + a_{1q}S_q + \varepsilon_1 \\ X_2 &= a_{21}S_1 + \cdots + a_{2q}S_q + \varepsilon_2 \\ &\vdots \quad \vdots \\ X_p &= a_{p1}S_1 + \cdots + a_{pq}S_q + \varepsilon_p \end{aligned} \quad \text{.....(1)}$$

Or. Here S is a vector of q < p underlying latent variables or factors. A is the p matrix$X = AS + \varepsilon$×q stands for factor loadings and is a disturbance with an average of zero and is not correlated. The idea is that the latent variable Sℓ is a common source of variation among and explains their correlation structure. In contrast, the uncorrelated is unique to each and takes on the remaining unaccounted variation. Usually, Sj and j are modeled as Gaussian random variables, and these models fit the maximum likelihood. All parameters are in the covariance matrix$\varepsilon_j X_j \varepsilon_j X_j$

$$\Sigma = AA^T + D_\varepsilon \quad \text{.....(2)}$$

where Dε= diag[var(ε1),... , Var(εp)]. Sj, which belongs to Gaussian and is uncorrelated, makes it an independent random variable. Column A is called the factor loadings and is used to name and interpret the factors.

In factor analysis, two measures can assess the factorability of the data: the Kaiser-Meyer-Olkin (KMO) Test, which measures sample adequacy, and the Bartlett Test regarding Sphericity (Shrestha, 2021). KMO Tets is a test used to measure the suitability of data in factor analysis. This test calculates the MSA (Measure of Sampling Adequacy) value for each variable in the model and the whole model. The formula from MSA can be seen as follows.

$$MSA = \frac{\Sigma\Sigma\, r_{ij}^2}{\Sigma\Sigma\, r_{ij}^2 + \Sigma\Sigma\, a_{ij}^2} \quad \text{.....(3)}$$

where :

r_{ij}^2= simple correlation between the ith and jth variables

a_{ij}^2= partial correlation between the ith and jth variables

If there is an MSA value of less than 0.5, then factor analysis is considered unsuitable for the data used.

Meanwhile, in the Bartlett Test for Sphericity, the hypothesis to be tested is that all variables are orthogonal with the following test statistics.

$$\chi^2 = -\left(n - 1 - \frac{2p+5}{6}\right) ln|R| \quad \text{.....(4)}$$

where :

n = number of observations

p = number of variables

R = correlation matrix of the variables

If the chi-square test statistic shows a value of less than 0.5, it can be concluded that factor analysis can be used in the data set being tested.

(2) *Cluster Analysis*

Cluster analysis relates to grouping or forming segments from a set of objects into subsets or clusters, where things in one group will be more closely related to each other than objects in different collections. In cluster formation, three different algorithms can be used: combinatorial algorithms, mixture modeling, and mode seeking (Hastie et al., 2001).

This type of combinatorial algorithm works by directly assigning each observation object to a cluster without considering the probability model that describes the data. Then the model works with an optimization algorithm to minimize the loss function.

This type of mixture modeling works by assuming that the data is a sample iid from a population that can be described with the probability density function. This model then fits the information either with the maximum likelihood approach or the Bayesian approach.

The mode-seeking type works non-parametrically by trying to find a different mode from the opportunity density function. The observation object closest to each node will define each cluster.

The K-means algorithm is the most popular among the cluster analysis algorithms with its iterative methods. This algorithm can be used when all variables are quantitative, and the dissimilarity measure used is the Euclidean distance. The following is the formula used to calculate the Euclidean distance(Jiayi et al., 2019).

$$d(\vec{X}, \vec{Y}) = \sqrt{(\vec{X} - \vec{Y})^2} = \sqrt{\sum_{i=1}^{n} |x_i - y_i|^2} \quad \text{.....(5)}$$

RESULTS AND DISCUSSION

Characteristics of villages in Papua Province

In essence, development in the Papua region faces extraordinary challenges, so its implementation is not as easy as in other areas. Geographically, the Province of Papua is very far between regions with a variety of topography ranging from steep mountains and swampy lowlands to fragile soils and high seasonal rainfall. (World Bank & Australian Indonesia

Partnership, 2009) Based on the area's topography, 47.51 percent of villages in Papua Province are located on slopes/peak areas. In general, most people in 97.55 percent of villages have their primary source of income from the agricultural sector. The main commodity cultivated in 75.46 percent of villages is secondary crops (corn, beans, tubers).

As the province with the highest percentage of districts with low HDI status in 2018, the welfare of the people of Papua Province is undoubtedly a vital matter to study further. Poverty and underdevelopment are often identified with lagging areas; This is in line with the poverty data released by BPS in 2017, which noted that Papua has the highest percentage of poor people, namely 27.62 percent. In 2017 the village government in Papua Province issued 62,274 poverty letters/certificates of incapacity (SKTM), where Lanny Jaya was the district with the highest SKTM issuance of 3,345. To meet the need for drinking water, 51.85 percent of villages in Papua Province still rely on springs as the community's leading source of drinking water.According to a study by the Environmental Management Agency (BPLH). The problem of access to clean water and healthy sanitation in Papua Province. Can be caused by several things, including the relatively low culture of clean living; the significant dependence of the Papuan people on natural water sources; and geographical characteristics that (sheer area) make it difficult for pure water distribution networks to rivers and swamps (Trijayanti, 2018).

The progress of a region's economy is inseparable from the role of infrastructure, especially roads in the area. Adequate road infrastructure greatly supports community accessibility and facilitates the flow of distribution of goods/services so that a faster economic cycle occurs. Unfortunately, the condition of road infrastructure in Papua Province is still not as expected. There are 98 villages in Papua Province with inter-village transportation only accessible by air. In addition, for towns with access between villages using land routes, the most comprehensive type of road surface in 44.56 percent of villages is still dominated by dirt roads, with four-wheeled vehicles impassable all year round in 75.95 percent of villages.

Furthermore, the regional security factor is also an essential issue in efforts to accelerate the development of a region. Infrastructure development will certainly not go well if a sense of security for developers and workers does not support it. From June 2017 to May 2018, it was recorded that 447 (8.1 percent) villages experienced incidents of mass fighting. Table 2 shows that of all the villages that experienced mass fights, the highest number of incidents came from mass conflicts between community groups, with 747 incidents. On average, there are around 62 to 63 incidents of mass fights between community groups every month in Papua Province. This non-conducive atmosphere creates a sense of insecurity and can hinder the process of regional development for villages in Papua. One of the main objectives of infrastructure development is to open up the isolation of underdeveloped villages in Papua.

Table 2. Number of Incidents of Mass Fights by Type of Mass Fights in Papua Province, June 2017 - May 2018

Mass Fight Types	Number of events
Between community groups	747
Inter-village community groups	139
Community groups with security forces	24
Community groups with government officials	76
Student/student	9
Between tribes	127
Other	32

Source: 2018 Village Potential Data (processed)

Even though, in various aspects, Papua's condition is generally lagging behind other regions in Indonesia, the role of the underdeveloped villages themselves as subjects and actors of development in their respective areas is, of course, very much needed. Initiative and creativity from underdeveloped rural communities must be sharpened even more. Indonesia's competitiveness needs to focus on developing superior product competitiveness in areas still at a low level of progress, such as villages, underdeveloped regions, and transmigration (Purbantara et al., 2021). Based on the 2018 Podes data, 352 towns have superior product products in their villages, but only 41 villages can reach export markets to other countries.

Regency Clusterization in Papua Province

In the initial exploration stage, cluster analysis was carried out in districts in Papua Province based on research variables. Cluster analysis using k-means grouped districts in Papua Province into two clusters. From the average value of each variable in each cluster, it can be concluded that cluster 1 is a group of districts with more progress than cluster 2. Furthermore, cluster 1 has a higher percentage in terms of the proportion of villages that already have access to land transportation and telecommunications infrastructure, access to health facilities, educational facilities, access to more permanent drinking water sources, and access to better waste management. Even though it has separated the two clusters that do not intersect,

Factor analysis was conducted to identify latent factors among the variables studied. The research starts with the KMO Test to determine the factor adequacy value. In the first stage of the KMO Test, the MSA value of the variable is above the sufficient limit of 0.70, but there are still several variables that have an MSA value below 0.50, namely the healthy_02 and sani_04 variables. After removing the healthy_02 and sani_04 variables, the KMO Test was repeated. The results of the second KMO Test, which can be seen in Table 3, show that the current set of variables has a higher overall MSA, and there are no variables with MSA values below 0.50.

Table 3. KMO Test Results for Each Variable

Variable	MSA	Variable	MSA	Variable	MSA
infra_01	0.81	healthy_01	0.74	sani_02	0.84
infra_02	0.81	healthy_03	0.75	sani_03	0.90
infra_03	0.66	educate_01	0.71	sani_05	0.66
infra_04	0.82	sejah_01	0.74	eco_01	0.68
infra_05	0.60	sejah_02	0.63	eco_02	0.83
infra_06	0.67	sani_01	0.85	eco_03	0.67
infra_07	0.70				

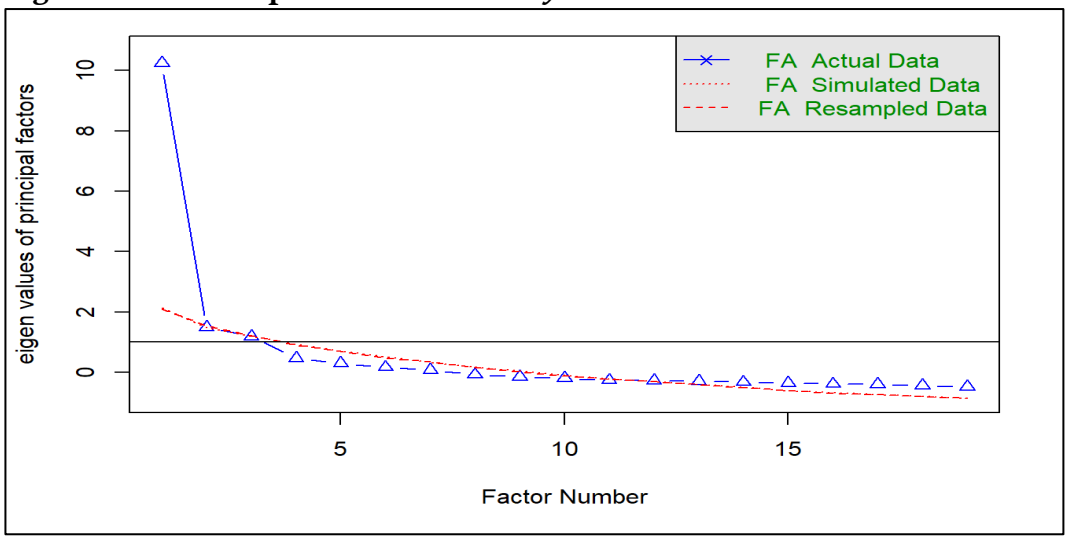
Next, the Bartlett Test for Sphericity was carried out to check whether there were pairs of variables that correlated among all the variables in the dataset. The test results in Table 4 show that pairs of variables have significant correlations in the dataset so that the factor analysis process can continue.

Table 4. Bartlett Test Results for Sphericity

Chi-square	*P_value*	df
554.37	0.00	171.00

An examination is carried out using a scree plot to determine the number of factors. The results of the scree plot analysis in Figure 4 shows that the optimal number of elements is three factors.

Figure 4. Check up result*Parallel Analysis Scree Plot*



For the model specification used in factor analysis, it is assumed that the factors are non-independent. This assumption is based on the possibility of a link between health and economic factors, infrastructure and education factors, and the like. Thus, the rotation used is oblique rotation using the ProMax approach. The factor analysis results showed that the three factors used were sufficient. Factor interpretation is based on the loading value of each variable that makes up a particular factor.

Table 5. Results of Factor Analysis Variable Grouping

Factor	Code	*Loading Value*	*Loading Sign*	Interpretation
1	infra_01	1.1001	+	
1	infra_02	1.0614	+	The dominant factor is infrastructure and telecommunication
1	infra_04	0.8100	+	
1	infra_03	0.7670	+	
1	infra_05	0.6952	+	
1	infra_06	0.5691	+	
2	sani_02	1.0361	+	
2	eco_02	1.0151	+	
2	sani_03	0.9484	+	The dominant factor is sanitation and economy
2	sejah_02	0.6407	+	
2	eco_03	0.5569	+	
2	eco_01	-0.3866	-	
2	sani_05	0.3269	+	
3	healthy_01	1.1365	+	
3	educate_01	1.1327	+	The dominant factors are health and education
3	infra_07	0.6393	+	
3	healthy_03	0.5989	+	
3	sani_01	0.5989	+	
3	sejah_01	0.4047	+	

In Table 5, it can be seen that Factor 1 is generally related to the availability of transportation and telecommunication infrastructure. The higher the percentage of villages with access to land transportation and communication, the higher the Factor 1 score for a district. Meanwhile, Factor 2 is more related to the dimensions of sanitation facilities and the dimensions of the economic activity of the majority of the villagers. The higher the percentage of villages with good sanitation facilities, the higher the Factor 2 score for a district. If the rate of towns where most of the population has a primary source of income other than agriculture, then the Factor 2 score will also be higher for that district. What's interesting about Factor 2 is that the variable percentage of villages with markets gives a loading with a minus sign for Factor 2 scores. So when a district has a high share of towns with needs, the district's Factor 2 score will be lower. This could be interpreted as related to the existence of markets that tend to produce market waste, so districts with a high percentage of the market must compensate for this from the sanitation dimension so that the Factor 2 score is maintained. In addition, the variables included in the sanitation group in Factor 2 are generally related to sanitation infrastructure. So that it can also be interpreted that areas with a high score for the economic dimension typically also have increased availability of cleanliness infrastructure dimensions. Whereas Factor 3 is more related to the availability of education and health facilities. The higher the percentage of villages with education and health facilities, the higher the Factor 3 score for a district. The sanitation group variable included in this

factor is related to the availability of drinking water facilities, so it is more related to public health factors.

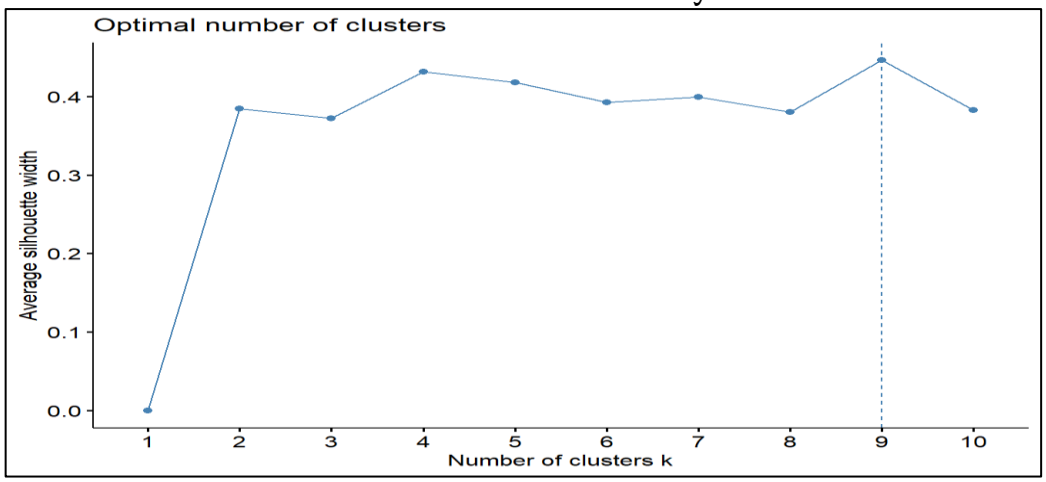
A Cronbach's Alpha for Consistency test was carried out on these three factors to test the consistency of the factors formed. The alpha value from the test results can be seen in Table 6. Generally, alpha is considered sufficient if greater than 0.7, so the three factors meet the adequate requirements.

Table 6.Cronbach's Alpha Test Results for Consistency

Factor	*Alpha*
1	0.9336
2	0.7750
3	0.9220

Furthermore, to determine the number of clusters based on the scores of the three factors above, cluster analysis was again performed using k-means. Figure 5 shows that nine groups are optimal based on the ASW value. But visually, the ASW value in nine clusters was slightly higher than forming four sets, so it was decided to use only four groups.

Figure 5. ***Average Silhouette Width (ASW)*** **On Each Number Of Clusters Based On The Results Of Factor Analysis**



Visually, Figure 6 shows the grouping of districts in Papua Province using 4 clusters. It can be seen that clustering gives good results, and there are no overlapping clusters. As for the regencies that are members of each group, details can be seen in Table 7.

Figure 6. District Grouping Results in Papua Province Based on Cluster Analysis After Factor Analysis

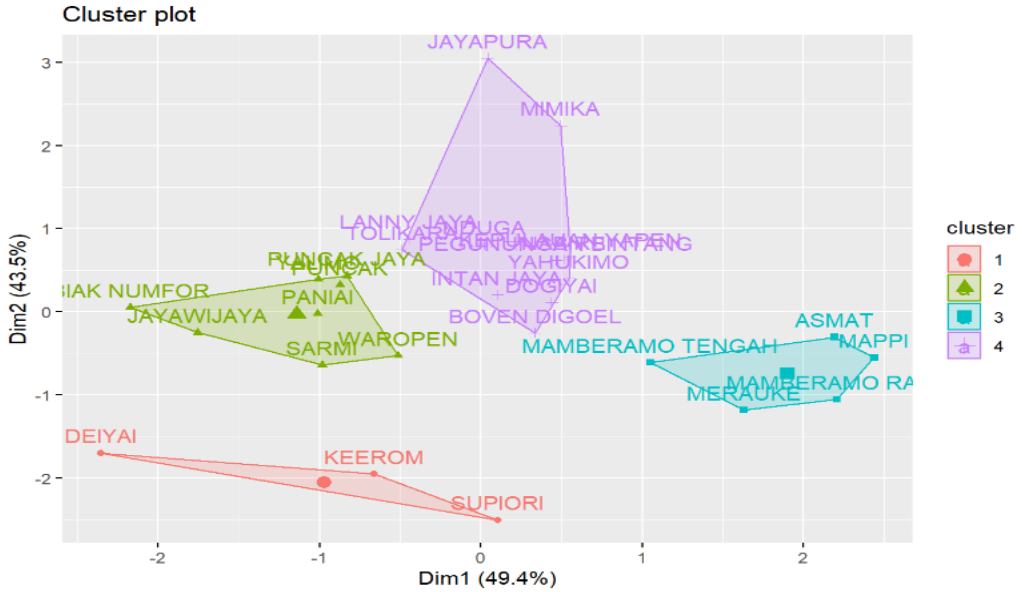


Table 7. List of Regencies in Each Cluster

Cluster	Regency
1	Deiyai, Keerom, Supiori
2	Biak Numfor, Jayawijaya, Paniai, Puncak, Puncak Jaya, Sarmi, Waropen, Yalimo
3	Asmat, Mamberamo Raya, Mamberamo Tengah, Mappi, Merauke
4	Boven Digoel, Dogiyai, Intan Jaya, Jayapura, Yapen Islands, Lanny Jaya, Mimika, Nabire, Nduga, Bintang Mountains, Tolikara, Yahukimo,

Table 8. Average Score of Each Factor by Cluster

Cluster	Factor1	Factor 2	Factor 3
1	2.3011	-2.1840	0.6601
2	1.1811	-0.2069	-1.1537
3	-1.7100	-0.6426	2.3162
4	-0.6502	0.9516	-0.3609

Based on the clustering results, four clusters were obtained with an average score for each factor which can be seen in Table 8. Cluster 1 is the district with the highest factor 1 score among the other two clusters; This indicates that communities in cluster 1 have a higher percentage of villages with access to transportation and telecommunication infrastructure. Cluster 4 has the highest Factor 2 score compared to the other three clusters, indicating a district group with a higher percentage of villages with sanitation and economic facilities than the other three clusters. While cluster 3 has the highest Factor 3 score,

Based on the clusters formed, it can be concluded that cluster 1 requires development that is more focused on improving sanitation and economic dimensions. Meanwhile, cluster 2 involves action that is more focused on enhancing the dimensions of health and education. Cluster 3 requires more intensive development for infrastructure and telecommunication factors. As for cluster 4, it is necessary to increase the infrastructure-telecommunication and health-education dimensions.

Table 9. Number of Regencies/Cities in Papua Province Based on Clusters and HDI Categories

Cluster	HDI category			Total
	Low	Currently	Tall	
1	1	2	0	3
2	5	2	1	8
3	4	1	0	5
4	7	3	2	12

Based on Table 9, almost all clusters are still dominated by districts with low HDI categories, except for cluster 1, which has the most significant percentage of sections with medium HDI categories. Cluster 3 is the cluster that has the highest rate of districts with a low sort HDI which reaches 80%. What is interesting is that from Table 9, it can also be seen that the main obstacle to increasing the HDI in Papua Province is the transportation and telecommunication infrastructure factor. The poor condition of transportation infrastructure will impact the lack of accessibility for the community to reach education and health facilities and limit the community's economic activities; This can be seen in Table 9; there are 11 districts from clusters 3 and 4 that still have a low HDI category. In clusters 3 and 4, development needs to be focused on improving transportation and telecommunication infrastructure. Topographically, most of the eleven districts are located on slopes/peaks. The central government has been trying to boost the development of Trans Papua along about 4330 km, connecting all of Papua from Sorong to Merauke. It is hoped that Trans Papua, targeted to be completed in 2019, will be able to make a significant difference in increasing the HDI in Papua Province. For the village government, allocation of the village fund budget can be prioritized on the construction of connecting roads from the village to the Trans Papua road so that access increases community accessibility. Topographically, most of the eleven districts are located on slopes/peaks. The central government has been trying to boost the development of Trans Papua along about 4330 km, connecting all of Papua from Sorong to Merauke. It is hoped that Trans Papua, targeted to be completed in 2019, will be able to make a significant difference in increasing the HDI in Papua Province. For the village government, allocation of the village fund budget can be prioritized on the construction of connecting roads from the village to the Trans Papua road so that access increases community accessibility. Topographically, most of the eleven districts are located on slopes/peaks. The central government has been

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In Table 9, 5 districts with a low HDI category are in cluster 2. Cluster 2 has a common factor value on the sanitation and economic conditions of the village community. So to increase the district HDI in cluster 2, programs and policies compiled by the government must focus on fulfilling sanitation and economic facilities, for example, in terms of providing markets. Based on the 2018 Podes data, only 11 percent of villages in Papua have demanded, even though the existence of a market is essential as a trigger for economic activity so that it can improve people's welfare (Basri, 2017). Local revenue, however, the addition of market facilities must be balanced with the availability of market waste disposal and processing facilities so as not to cause problems with environmental sanitation factors.

CONCLUSION

There are still disparities in development in Papua Province, which can be seen from the characteristics of the villages in each district; This impacts the inequality of human development between districts in Papua Province. This study's results indicate that mapping development priority scales to increase district HDI in Papua Province can be done by examining the characteristics of villages in each region. The preparation of an analytical framework using cluster analysis and factor analysis can provide objective input in classifying districts based on the features of the villages of each

section. These inputs can become the basis for a study for formulating a more equitable development plan while considering each district's needs.

Location of district clusters in Papua Province with a different priority focus on increasing HDI. The main focus of the district HDI improvement priorities in Papua Province is divided into three through factor analysis, namely infrastructure-telecommunications factors, sanitation-economic factors, and health-education factors. The results of this study show that, in general, most of the districts in Papua Province still have low HDI status in each of the formed clusters. To spur improvements in the quality of human development in Papua Province, it is hoped that the budget planning and preparation of programs made by the local government will adapt to the characteristics of each village so that human development becomes more focused and has a significant impact on increasing the HDI in Papua Province. The main obstacle to increasing the HDI in Papua Province is the transportation and telecommunications infrastructure factor. So that both the central and village governments can prioritize development programs on infrastructure and telecommunications in Papua Province.

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